Population Models for Carbonate Workbench

Scoping

a. Static Environmental context – productivity
b. Dynamic Population context – community linkages
    - Basic / inefficient
    - Optimized

Volterra-Lotke

- Simplest:
  - Intrinsic rates of increase of prey:a, density related
  - Predation rates:b, conversion:c to prey offspring, density- related
  - Mortalities:m
  - & Environmental homogeneity (hiding places)
  - & Competition

$$\frac{dH}{dt} = aH - bHC$$

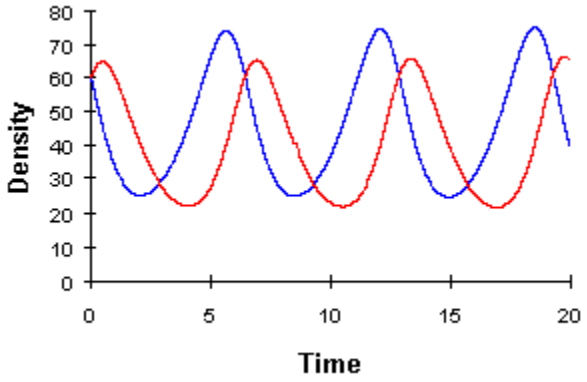
$$\frac{dC}{dt} = cbHC - mC$$

H, herbivore population

C, Consumer population

- Practical:
  - Numerical solutions
  - Limits to complexity

H
C



Ecopath

- Production = catch + predation + net migration + biomass accumulation + other mortality
- Consumption = production + respiration + unassimilated food

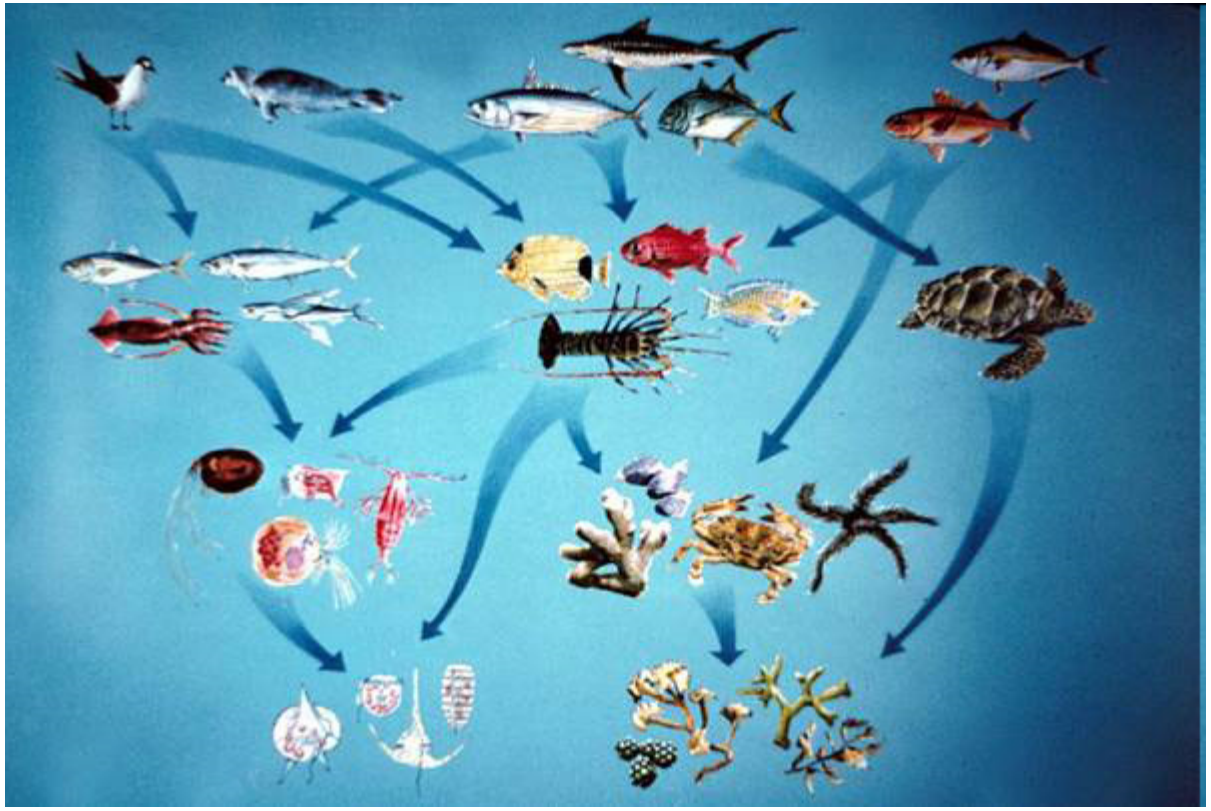
Parameters needed (raw or estimated): biomass, production/biomass ratio (or total mortality), consumption/biomass ratio, and ecotrophic efficiency for each of the functional groups in a model

Path Model

Trophic energy flows => population and growth rates

Lots of information from ecologists, reef studies, carbon biogeochemists

We can use guilds (as zoologists do) for palaeo-communities



For example:

- Trophic web
- Sessile / vagrant
- Soft / Skeletonized
- Hetero- / Autotroph
- R/K strategies
- Feeding scales
- Grazing/Filter/Predator
- Framework / Encrusting / Interstitial